What Can Be Gained From Yet One More Major Field Study?

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Outline

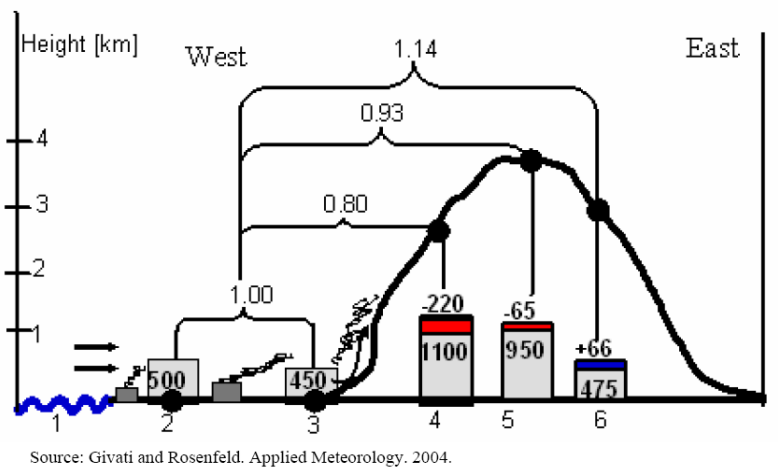
- CalNex and CalWater: an overview
- Past CEC field studies
- Water and energy research questions
- Past ARB air quality studies
- Air Quality and climate change research questions

CalNex and CalWater: an overview

- A potential collaborative field study involving: NOAA, ARB, CEC, and DWR
- CalNex: a summer air quality and climate change field campaign to take place in the summer of 2010 (NOAA and ARB leading)
- CalWater: a winter/spring regional climate change field campaign that would start in October 2009 and end late in the spring of 2010 (NOAA, PIER/CEC, and DWR leading)
- Some CalNex and CalWater measurement activities would support each other (One overall study)

Past relevant CEC studies

- PIER supported the 2000 Central California Ozone Study
- Modeling study by Prof. Mark Jacobson (2004)
  - Aerosols are affecting our regional climate
  - Aerosols are reducing precipitation levels
- Two field studies using research aircrafts (2005, 2006)
- Measurement of BC in snow and rain in the Sierra Nevada [see the presentation by Odelle Hadley]
- Using UAV to study the transport of BC and other pollutants from Asia (on-going) [see the presentation by Craig Corrigan]

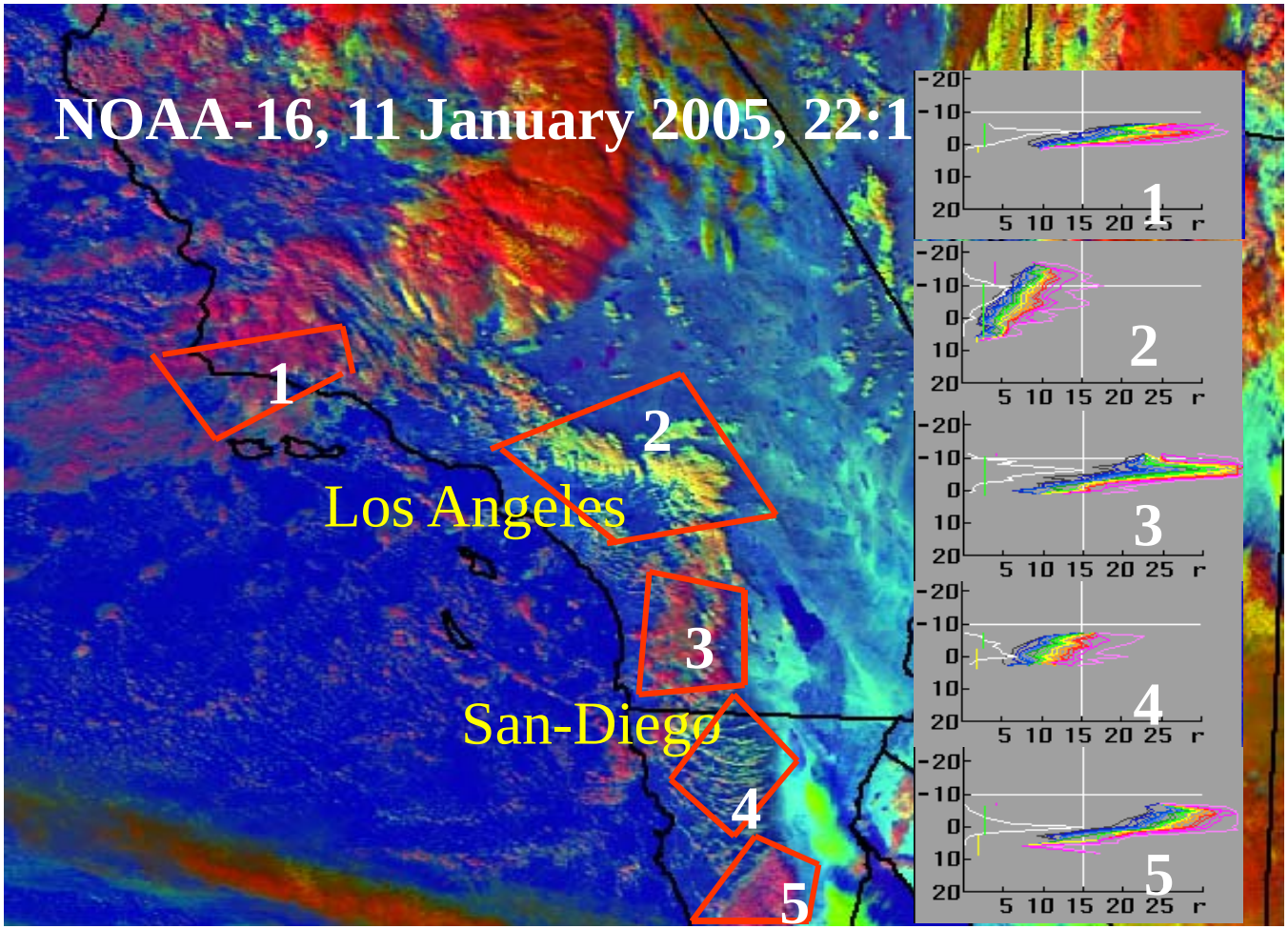


Source: Givati and Rosenfeld. Applied Meteorology. 2004.

Precipitation and snow level reductions in the order of 10 percent

About 15% of the electricity generated in California comes from hydropower units. Its importance to peak generation is enormous

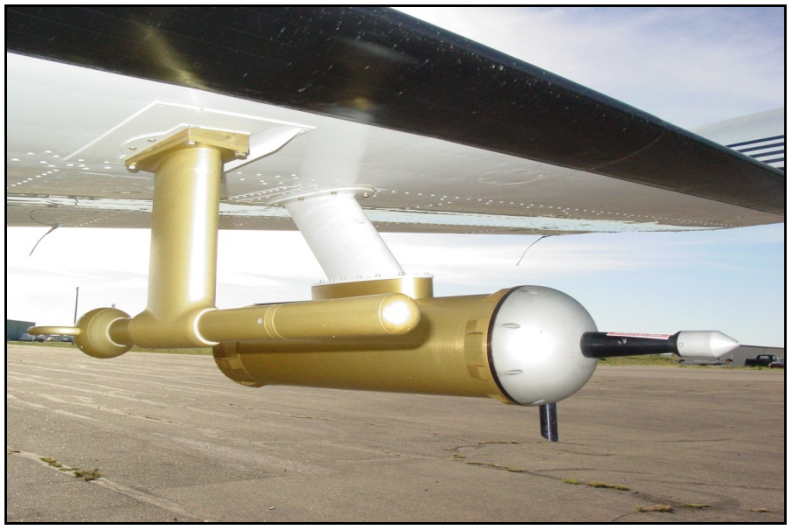
Satellite Based Estimates of Droplet Sizes

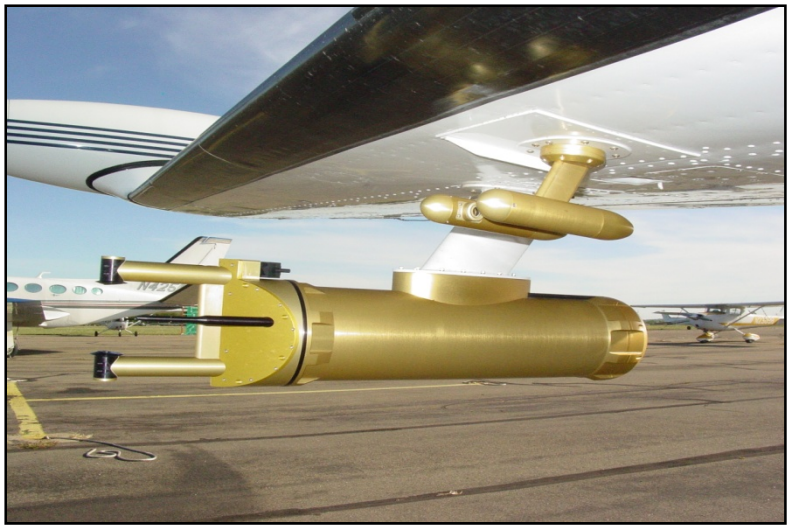


Source: Aircraft Measurement of the Impacts of Pollution Aerosols on Clouds and Precipitation Over the Sierra Nevada
Publication Numbers: CEC-500-2008-015

In-situ measurements corroborated what was being inferred from the satellites

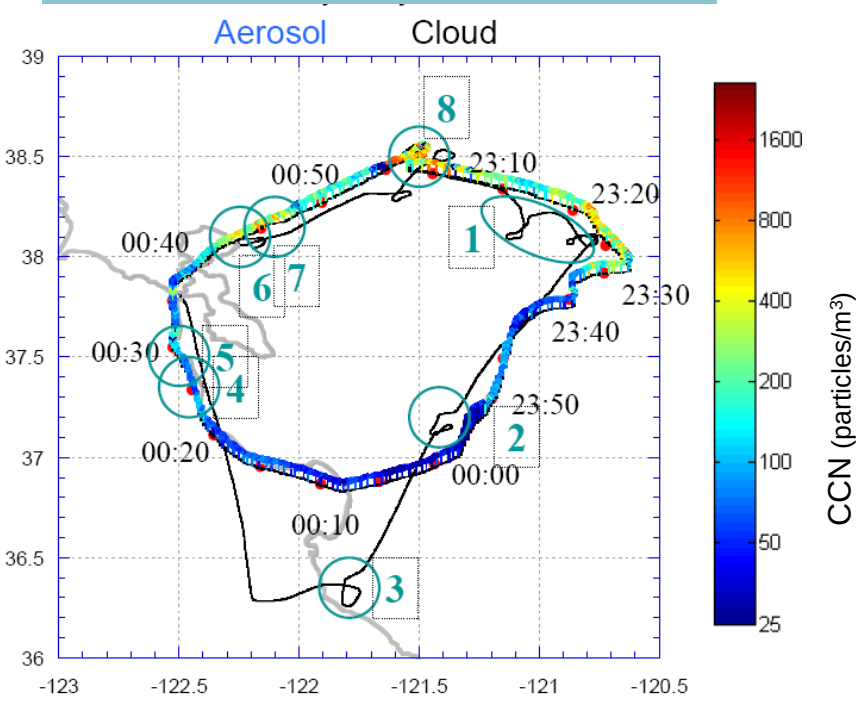
Cloud Physics Aircraft





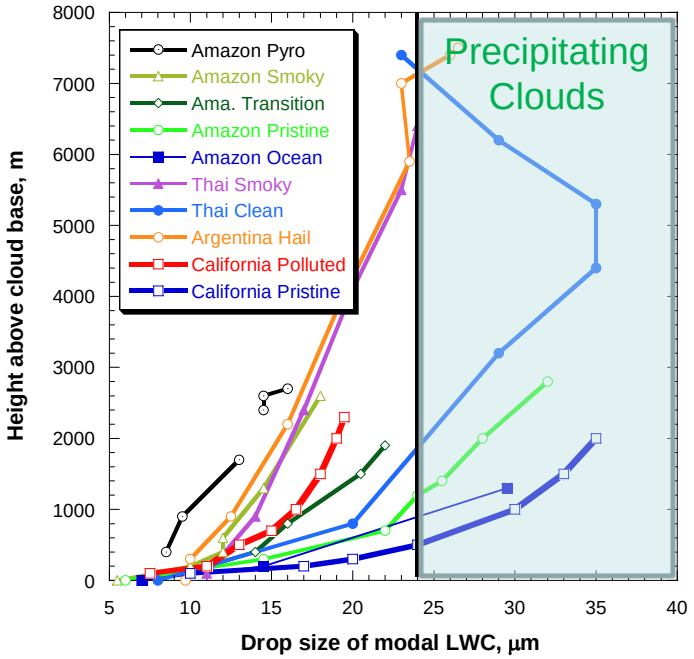
Source: Aircraft Measurement of the Impacts of Pollution Aerosols on Clouds and Precipitation Over the Sierra Nevada
Publication Numbers: CEC-500-2008-015

Aircraft Trajectory 02 28 2006



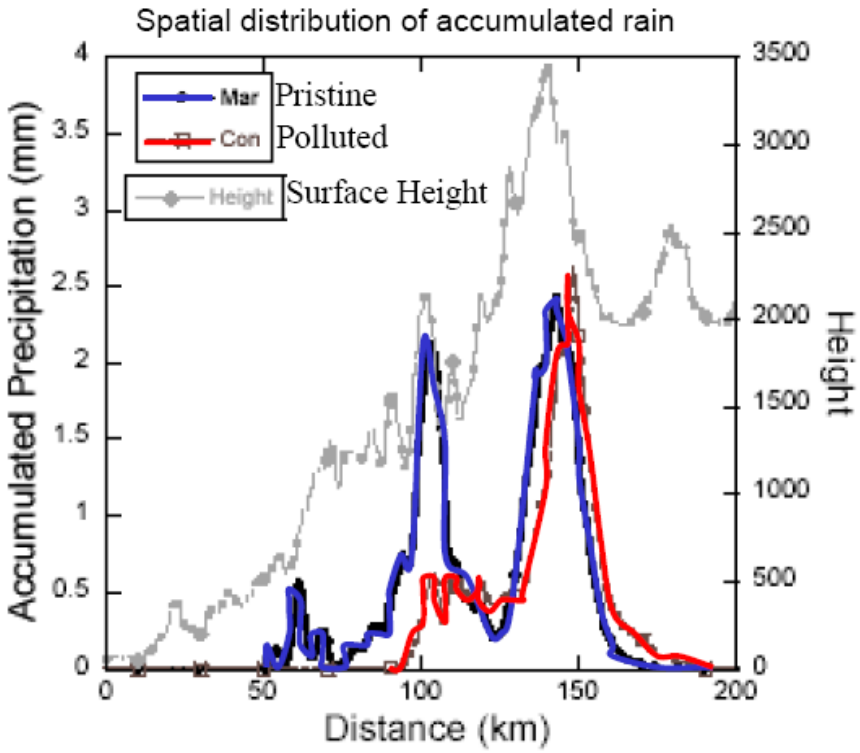
Source: Aircraft Measurement of the Impacts of Pollution Aerosols on Clouds and Precipitation Over the Sierra Nevada
Publication Numbers: CEC-500-2008-015

Drop size vs height above cloud base



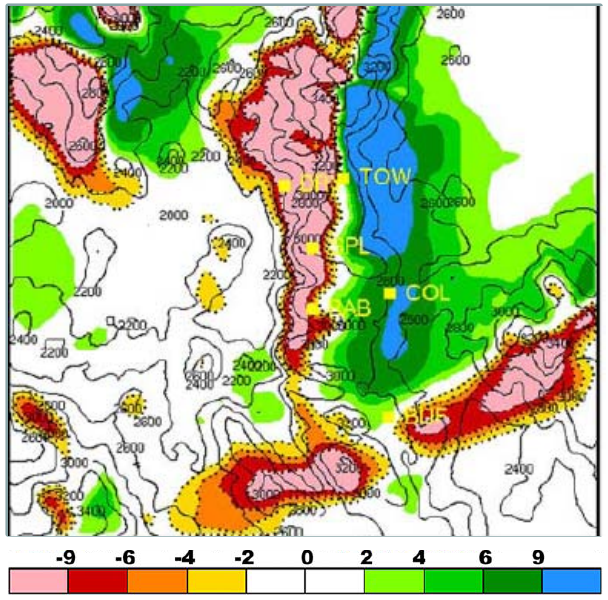
(See PIER report or
Fig. 13 of Rosenfeld et al., JGR 2008)

Preliminary Numerical Studies Using Improved Models Also Suggest that Aerosols Can Negatively Impact Orographic Precipitation



Source: B.Lynn, A. Khain, D. Rosenfeld, and W. L. Woodley. 2007." Effects of Aerosols on Precipitation from Orographic Clouds." Journal of Geophysical Research. 112. 2005

Accumulated SWE difference (mm)

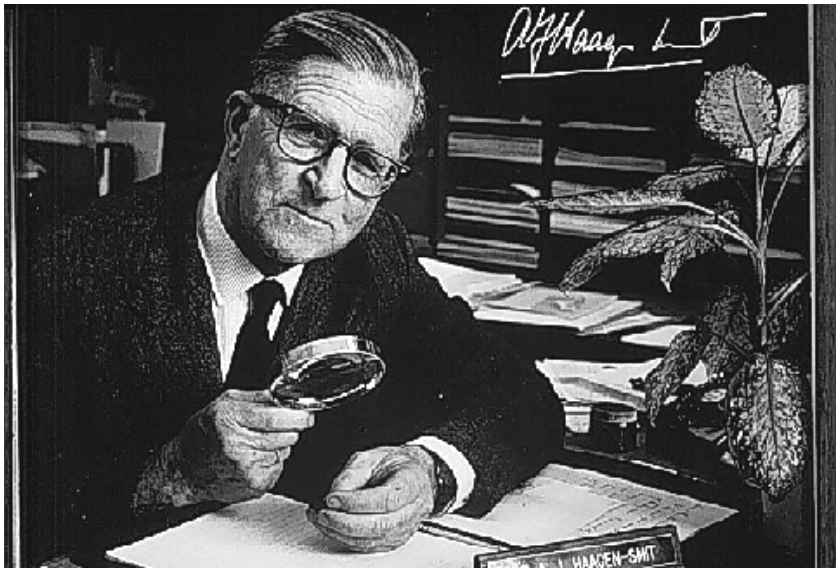


Source: Stephen M. Saleeby and William R. Cotton. Interactive Impact of CCN, GCCN, and IFN on Snowfall Over the Park Range. 2008. http://ams.confex.com/ams/pdfpapers/139068.pdf

Main Research Questions for CalWater (partial list)

- What is the chemical composition of the CCN? What are the sources or processes involved in their formation?
- Could reducing CCN be an effective adaptation strategy to climate change?
- Long-range transport and deposition of black carbon on snow, and its impacts. Can we measure changes in snow reflectivity? What is the fate of BC during snow melting?
- Atmospheric rivers (see the presentation by Marty Ralph)

Air Pollution in California is a Long Standing Issue



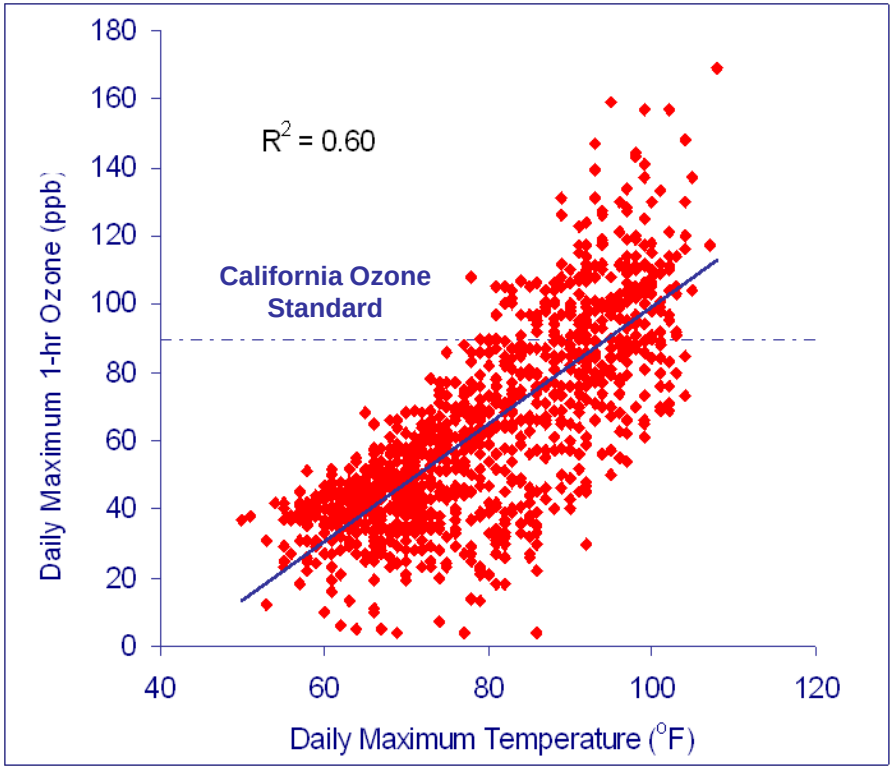
Air Quality Field Studies in California

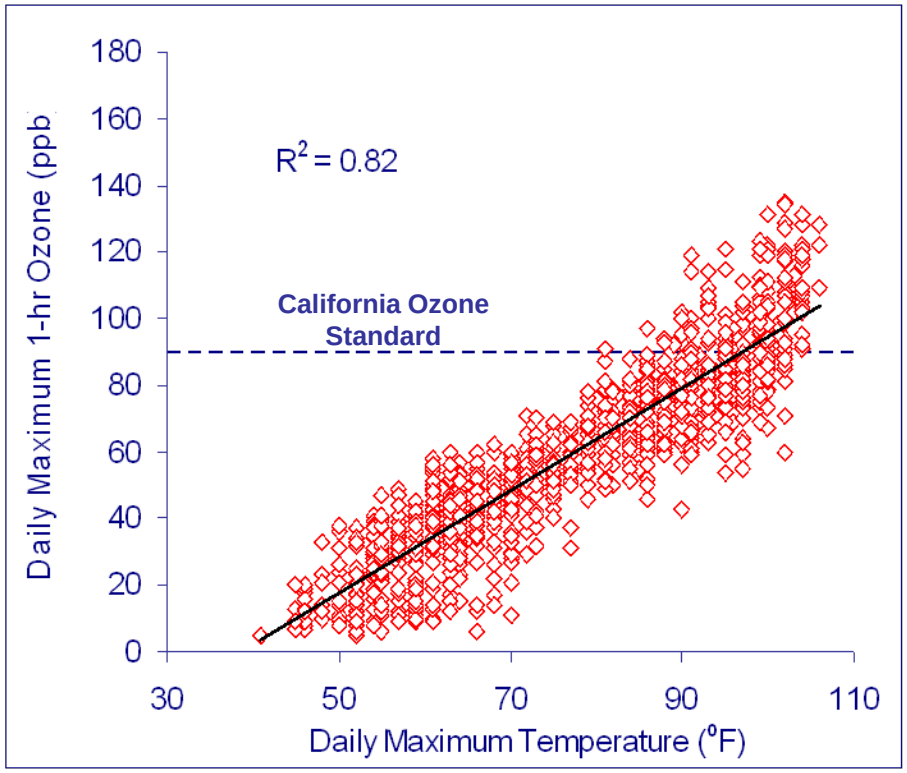
- Field Studies began in 1969/1970
- Recent major efforts include SCAQS87,SCOS-97, CCOS and CRPAQS
- Dozens of smaller efforts (LTADS)

Why do we still need another field study?

- How many studies of human physiology have there been?
- Need to understand the chemistry and physics of the atmosphere well enough to mathematically model
- California has exceedingly complex terrain and meteorology

Climate and Air Quality





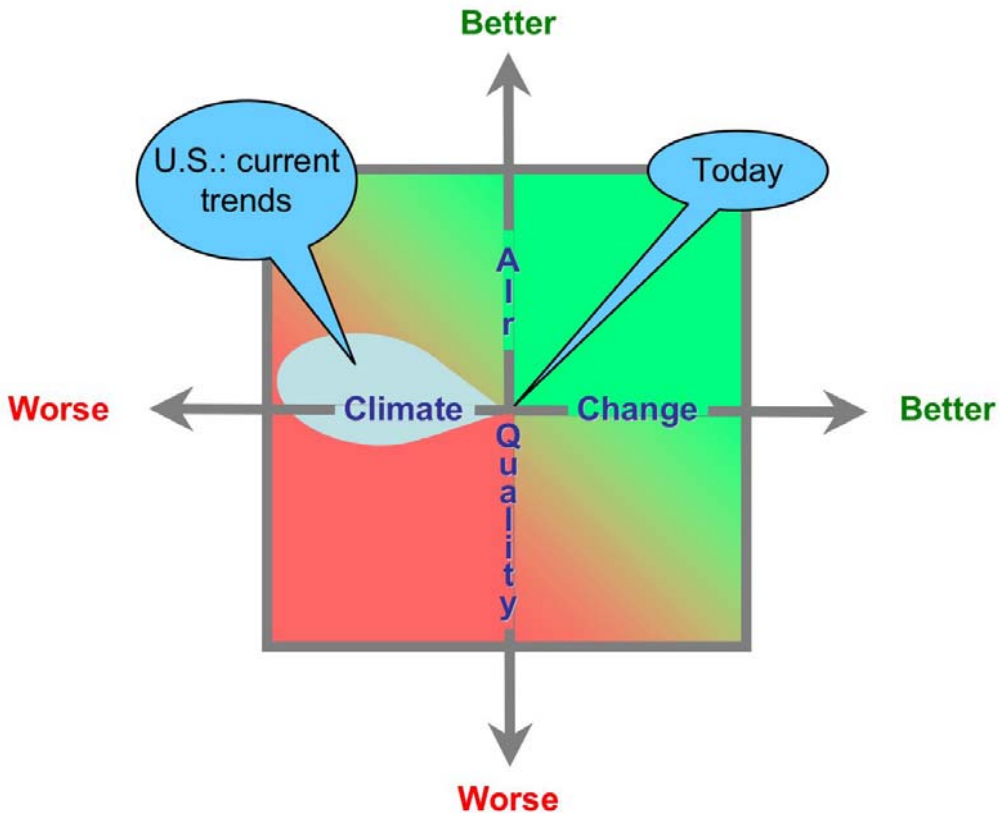
Riverside, 2003-2005

Increased warming

Fresno, 2003-2005

N. Motallebi, 2007

Nexus between Air Quality and Climate Change

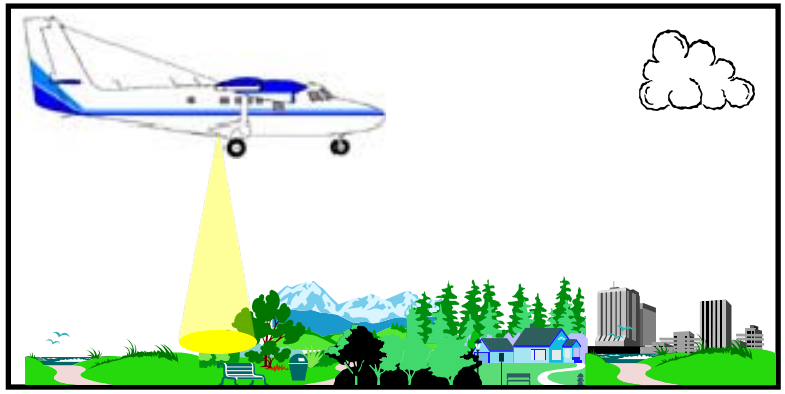


NOAA

NOAA WP-3D Aircraft - urban and power plant plume studies, emissions verification, regional and inter-regional transport, day/night O_3/PM chemistry, aerosol optics

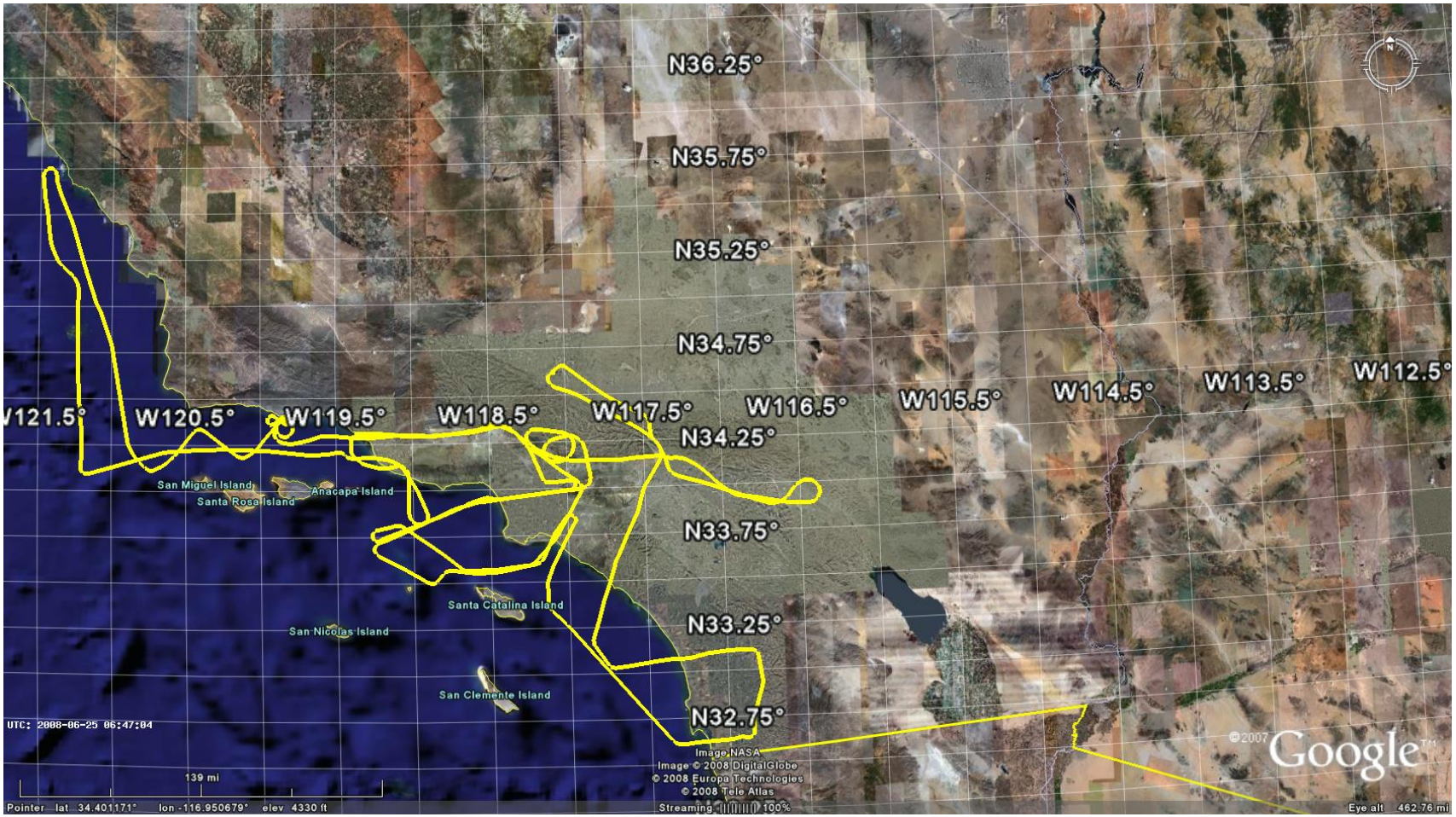
NOAA R/V Ronald H. Brown - marine chemistry, marine emissions, coastal emissions, chemistry in the land/bay/sea breeze recirculation, aerosol - physics, - chemistry, - optics and satellite validation.

NOAA LIDAR Aircraft - regional distribution of O_3 and PM, urban and power plant plume studies, regional and inter-regional transport, boundary layer evolution and variability.



In Addition: Wind profiler network, Instrumented tall tower, flux towers

ARCTAS California



Science Questions (partial)

- **How can we improve the emissions inventory for GHG, ozone and aerosol precursors?**
- **What are the most important chemical processes occurring during night?**
- **Are there significant differences between Central Valley and South Coast Air Basin precursors or ozone formation chemistry?**
- **What are proper oceanic boundary conditions?**
- **How best can we characterize and model air flow over coastal waters and the complex terrain of California?**

Planning a California Field Study in 2010 - Mozilla Firefox

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http://www.arb.ca.gov/research/fieldstudy2010/fieldstudy2010

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PLANNING AN AIR QUALITY AND CLIMATE CHANGE FIELD STUDY IN CALIFORNIA IN 2010

California Field Study Plan

This webpage provides information regarding planning a proposed air quality and climate change field study in California in 2010.

Public Planning Meeting

The two day planning meeting for 2010 CalNex will be held in the CalEPA building in Sacramento at the following times and locations:

Thursday October 16th, 2008
9:30 AM – 5:00 PM
Sierra Hearing Room,

Friday October 17
9:00 AM – 1:00 PM
1st Floor Training Room

Science White Paper

2010 CalNex White Paper

Meeting

- Meeting Announcement
- Meeting Agenda
- CalNex 2010 Science Questions
- Presentations

Program Links

Planning Participants

- National Oceanic and Atmospheric Administration (NOAA)
- California Energy Commission (CEC)

Field Studies

- Boundary Layer Wind Profiler Studies
- 1997 Southern California Ozone Study (SCOS97-NARSTO)
- Central California Ozone Study (CCOS)
- Lake Tahoe Atmospheric Deposition Study (LTADS)

Done

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